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(54) Apparat zum Falten von Wellpappezuschnitten, der mit einer Rillvorrichtung ausgestattet ist.

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Mitsubishi Jukogyo K.K.

Falt- oder Falzvorrichtung zur Herstellung von Faltkartons aus Wellpappe

Patentanspruch

Falt- oder Falzvorrichtung zur Herstellung von Faltkartons aus Wellpappe durch Falten oder Falzen von Wellpappelagen, dadurch gekennzeichnet, daß eine zusätzliche Kerbvorrichtung aus zwei Kerbwalzen zum Kneifen eines Falzabschnitts der Wellpappelage zwecks Einkerbung längs des Falzabschnitts in der Falt- oder Falzvorrichtung in einer Stellung entsprechend einer Anfangsphase eines Falt- oder Falzvorganges vorgesenen ist, der Zwischenraum zwischen den Kerbwalzen einstellbar ist und die beiden Kerbwalzen in einer gemeinsamen Ebene angeordnet sind, die dadurch gebildet ist, daß die Walze in bezug auf die Lotrechte unter einem Winkel entsprechend nahezu der Hälfte des Knickwinkels der Wellpappelage an der Stelle, an welcher die Kerbvorrichtung vorgesehen ist, schräggestellt ist.

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(54) Folding apparatus for corrugated cardboard sheets including a scoring device.

(57) A known folding apparatus for producing collapsed cardboard box materials by folding corrugated cardboard sheets, is improved by additionally providing a scoring device therein at the position corresponding to an initial period of a folding process. The scoring device consists of a pair of scoring rolls for pinching a fold portion of the corrugated cardboard sheet to score along the fold portion, the gap clearance between the scoring rolls is adjustable, and the pair of scoring rolls are disposed with a common plane formed by the rolls inclined with respect to the vertical direction by an angle equal to nearly one-half the bent angle of the cardboard sheet at the position where the scoring device is provided.

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-7

FOLDING APPARATUS FOR CORRUGATED CARDBOARD SHEETS INCLUDING A SCORING DEVICE

The present invention relates to an improved folding apparatus for corrugated cardboard sheets, and more particularly to a scoring device to be additionally provided in such improved folding apparatus.

Before entering description of the present invention, a known folding apparatus for producing collapsed corrugated cardboard box materials by folding corrugated cardboard sheets will be explained briefly.

Fig. 1 is a side view of a sheet eject section (1) of a box making machine in the prior art, Fig. 2 shows only a portion relevant to the present invention of the cross-section taken along line A-A in Fig. 1 and Fig. 3 shows the state where a corrugated cardboard sheet (2) worked in the sheet eject section (1) is being bent by a folding apparatus (3).

In Figs. 1 and 2, a corrugated cardboard sheet (2) being fed from the preceding stage of a process, is applied with scores (k) and slits (s) as seen in a sheet (2) shown in Fig. 4 and Fig. 5 (plan view corresponding to Fig. 4) during the period when it is passed through gap clearances between upper and lower scoring rolls (4) and (5) and then passed through gap clearances between slotting rolls (9) having slotter knives (8) and the opposed rolls (10) as guided by guide rolls (6) and (7).

The thus worked sheet (2) is folded as shown in Fig. 9 by means of folding rods (12), rules not shown for guiding folds and lower conveyor belts (13) in a folding apparatus (3) during

the period when it is being conveyed in the direction of arrows by means of conveyor belts (11) as shown in Fig. 3.

In such a heretofore known method of working, there was a shortcoming that since bending work is effected by the folding apparatus (3) shown in Fig. 3 after the sheet (2) has been applied with scores (k) by means of scoring rolls (4) applied with linings (14) of elastic material and opposed scoring rolls (5) under a flat condition of the sheet (2) as shown in Fig. 2, the scored sections would be restored to their original shape before bending, it is impossible to maintain the shape upon scoring, and so the scores would become obscure.

In addition, due to the fact that the sheet (2) is scored in a flat condition and hence a surface portion to be brought to the inside of the box is depressed, as the score is applied more intensely to make the fold clear, a more tension would be produced in the inner surface, and a phenomenon normally called "score break" would arise at the scored portion. This phenomenon is more remarkable in the case of a lower class of sheets. As one solution for preventing this phenomenon, scoring was carried out gradually by means of two or more stages of scoring devices, but the results were still unsatisfactory.

Still further, there was a disadvantage that if folding of a sheet is effected under such condition, the portions coming to the inside of a sheet (2') when it was worked ((C) in Fig. 6) would interfere with each other, and hence the sheet (2') would

be bent at a portion having a weak resistance due to the interference without being bent at a predetermined position.

Figs. 7 and 8 show the states of the sheets (2') folded by 180° resulted from the above-mentioned cause, Fig. 7 shows the state where the positions of the scored portions (k) (k) become lower than the contact surfaces (f) (f) and a gap distance (g) between pasting portions become narrower than a standard dimension, and Fig. 8 shows, on the contrary, the state where the positions of the scored portions (k) (k) become higher than the contact surfaces (f) (f) and a gap distance (g') between pasting portions become wider than a standard dimension. Such unstable formation of the gap space between the pasting portions is caused by the fact that the sheet (2') is not folded correctly at right angles along the scored portions (k) (k), and in such a case, the configuration of the folded sheet (2') becomes as shown in Fig. 10, which is not favorable.

It is therefore one object of the present invention to provide a folding apparatus for corrugated cardboard sheets which is free from the above-mentioned disadvantages in the prior art.

A more specific object of the present invention is to provide a folding apparatus for producing collapsed corrugated cardboard box materials, which can fold corrugated cardboard sheets correctly at right angles along scored portions.

According to one feature of the present invention, there is provided a folding apparatus for producing collapsed corrugated

cardboard box materials by folding corrugated cardboard sheets, in which a scoring device consisting of a pair of scoring rolls for pinching a fold portion of the corrugated cardboard sheet to score along the fold portion is additionally provided at the position corresponding to an initial period of a folding process, the gap clearance between said scoring rolls is adjustable, and the pair of scoring rolls are disposed with a common plane formed by the rolls inclined with respect to the vertical direction by an angle equal to nearly one-half the bent angle of said corrugated cardboard sheet at the position where said scoring device is provided.

The above-mentioned and other features and objects of the present invention will become more apparent by reference to the following description of a preferred embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side view showing one example of a sheet eject section of a paper making machine in the prior art,

Fig. 2 is a cross-section view taken along line A-A in Fig. 1,

Fig. 3 is a perspective view showing the state of a corrugated cardboard sheet being bent in a folding apparatus in the prior art,

Fig. 4 is a front view of a corrugated cardboard sheet applied with scores and slots,

Fig. 5 is a plan view of the corrugated cardboard sheet shown in Fig. 4,

Figs. 6, 7 and 8 are schematic cross-section views showing different folded states of a corrugated cardboard sheet folded by a folding apparatus in the prior art,

Fig. 9 is a perspective view of a folded corrugated cardboard sheet,

Fig. 10 is a plan view showing a folded state of a wrongly folded corrugated cardboard sheet, and

Fig. 11 is a cross-section view of a scoring device to be equipped in a folding apparatus according to the present invention.

Now one preferred embodiment of the present invention will be described with reference to the accompanying drawings. Fig. 11 is a cross-section view of a scoring device to be equipped in a folding apparatus according to the present invention, and this scoring device is disposed along line B-B in the folding apparatus in the prior art illustrated in Fig. 3. Also the bent configuration of the corrugated cardboard sheet (2') shown in Fig. 11 is the same as that of the sheet (2') shown in Fig. 3, and the sheet (2') is illustrated in a state where it has been already bent by a certain bent angle (α).

In Fig. 11, upper and lower scoring rolls (19) and (20) having, for instance, the illustrated configuration and rotatably carried by supports (17) and (18), respectively, which is in turn fixedly secured to frames (15) and (16), respectively, of a folding apparatus (3), are disposed in such manner that they may pinch a folding portion of the sheet (2') therebetween and may

be placed on a bisector (22) of an angle formed by the bent corrugated cardboard sheet (2') as opposed to each other. It is to be noted that sheet support rolls (21) and conveyor belts (11) shown in Fig. 11 are similar to those used in the folding apparatus in the prior art. In addition, there is separately provided a gap adjusting device for appropriately increasing or decreasing the gap clearance between the upper and lower scoring rolls (19) and (20). However, since this is a known device, illustration and description there of will be omitted.

Explaining now the operation of the novel folding apparatus, the operation that a corrugated cardboard sheet (2) is passed through the sheet eject section (1) shown in Fig. 1, then it is worked into the sheet (2') shown in Fig. 3 (the scoring along the folding portion could not be effected) and it is fed into a folding apparatus (3), is quite similar to that effected in the prior art apparatus.

In Fig. 11, the sheet (2') which has been conveyed on the sheet support rolls (21) by the conveyor belts (11) and which has been bent by a bent angle α° (45° or less) along a rule not shown, is applied with scores along the bent portions (at the same positions as the scores applied by the scoring rolls (4) and (5) in Fig. 1) by means of the upper and lower scoring rolls (19) and (20), and thereafter the sheet (2') is subjected to a bending work similar to that in the prior art by means of the folding apparatus (3).

The scoring in the prior art had a shortcoming that since it is effected entirely when the sheet is in a plane state, when the sheet is charged in a folding apparatus the scored portions would be restored to their original shape due to elasticity of the sheet itself, and hence the scores would become obscure. In addition, there was a short coming that if it is intended to score intensely to make the restoration of the scores little, then tensions would arise in the inside surface of the bent portion, "score break" would occur, and thus unacceptable products would be produced.

According to the present invention, even if scoring effected in the sheet eject section is not present or weak, scoring is effected to a fold of a sheet where the sheet has been bent by a certain angle by means of a pair of scoring rolls disposed in a tilted state by an angle equal to nearly one-half the bent angle of the sheet, and then bending is effected immediately, and therefore, strong and sufficient scoring can be achieved without restoration of the scored portions and without occurrence of score break owing to weak tensions in the surface on the inside, hence precise bending can be achieved. Accordingly, the proposed folding apparatus does not have the shortcomings that loss of raw materials in a production process and degradation of strength and quality of products such as score breaks generated in the sheet eject section as a result of necessitating intense scoring or surplus raw materials for preventing the score breaks

as is the case with the prior art forling apparatus, would be brought about, and therefore, the present invention can contribute to saving of resources and lowering of a cost.

Since many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not as a limitation to the scope of the invention.

WHAT IS CLAIMED IS:

1. A folding apparatus for producing collapsed corrugated cardboard box materials by folding corrugated cardboard sheets, characterized in that a scoring device consisting of a pair of scoring rolls for pinching a fold portion of the corrugated cardboard sheet to score along the fold portion is additionally provided in said folding apparatus at the position corresponding to an initial period of a fold process; the gap clearance between said scoring rolls is adjustable, and the pair of scoring rolls are disposed with a common plane formed by the rolls inclined with respect to the vertical direction by an angle equal to nearly one-half the bent angle of said corrugated cardboard sheet at the position where said scoring device is provided.

Fig.1

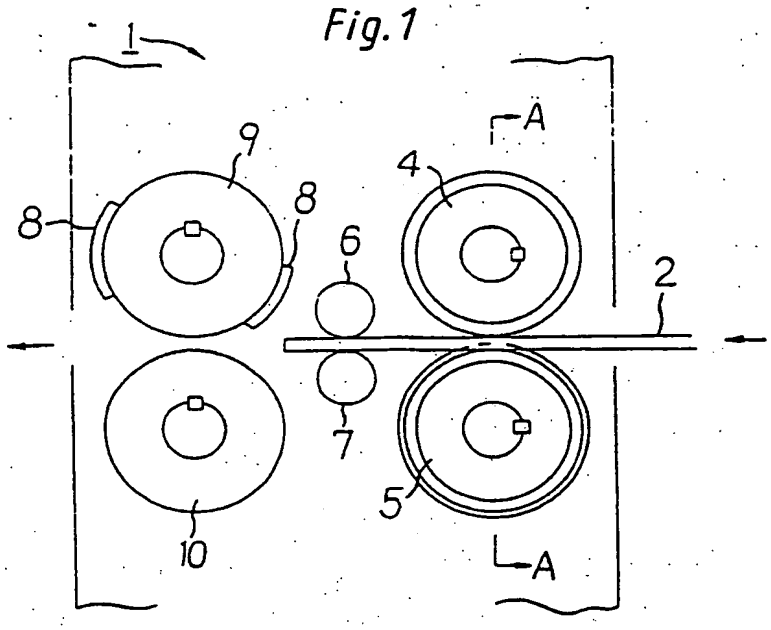


Fig.2

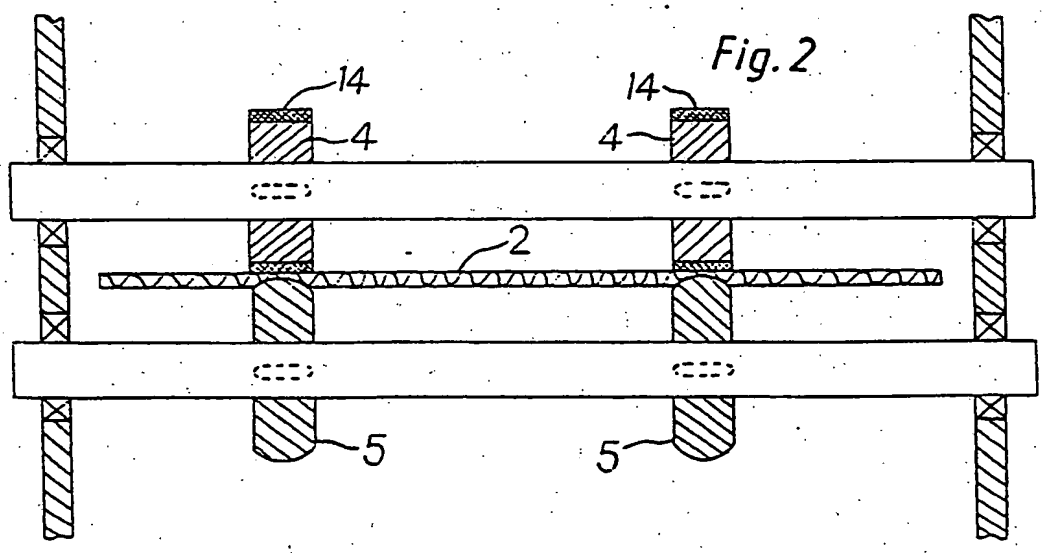


Fig. 3

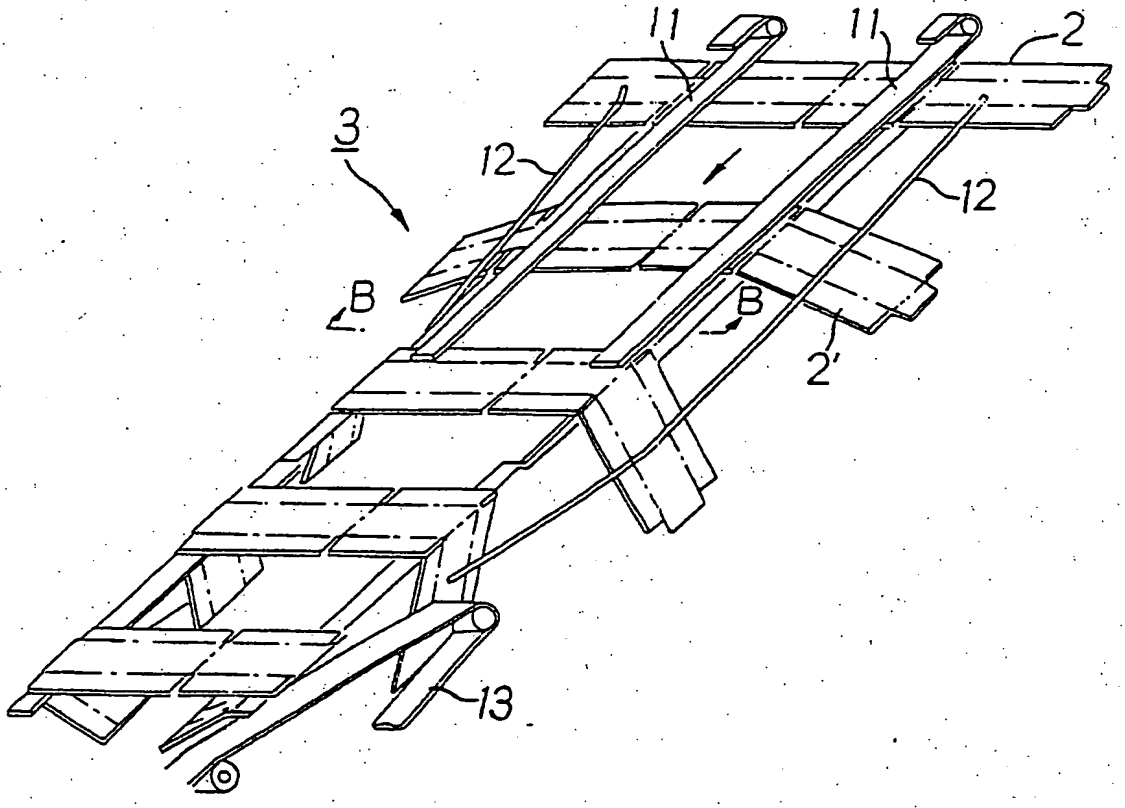


Fig. 4

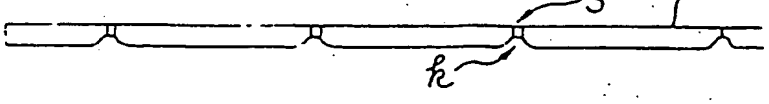


Fig. 5

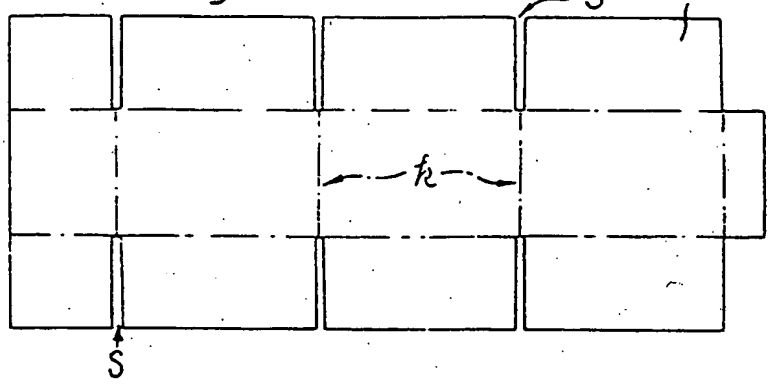


Fig. 6

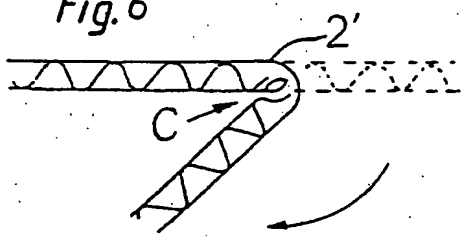


Fig. 7

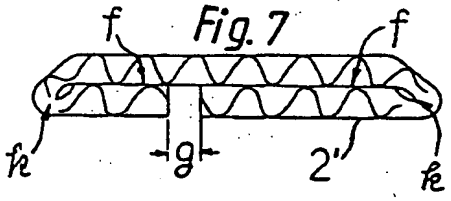
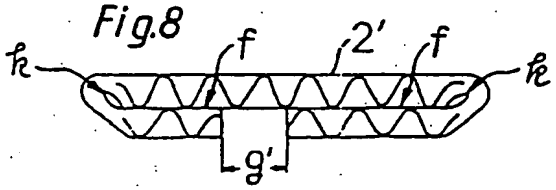


Fig. 8



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Fig. 9

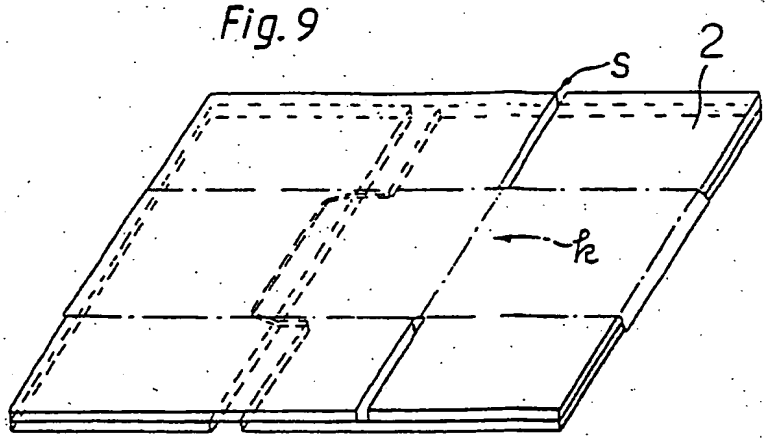
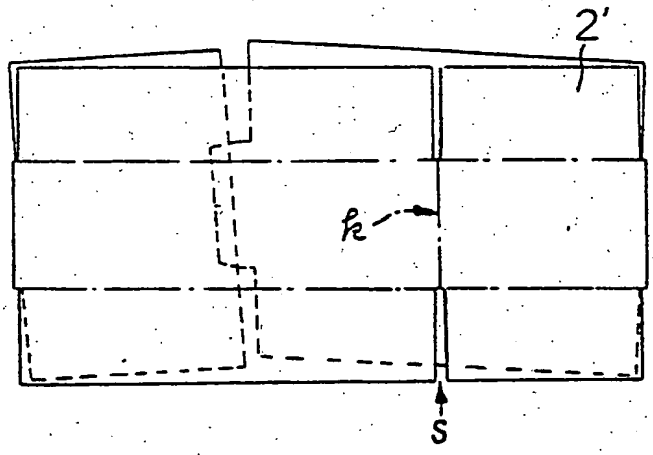
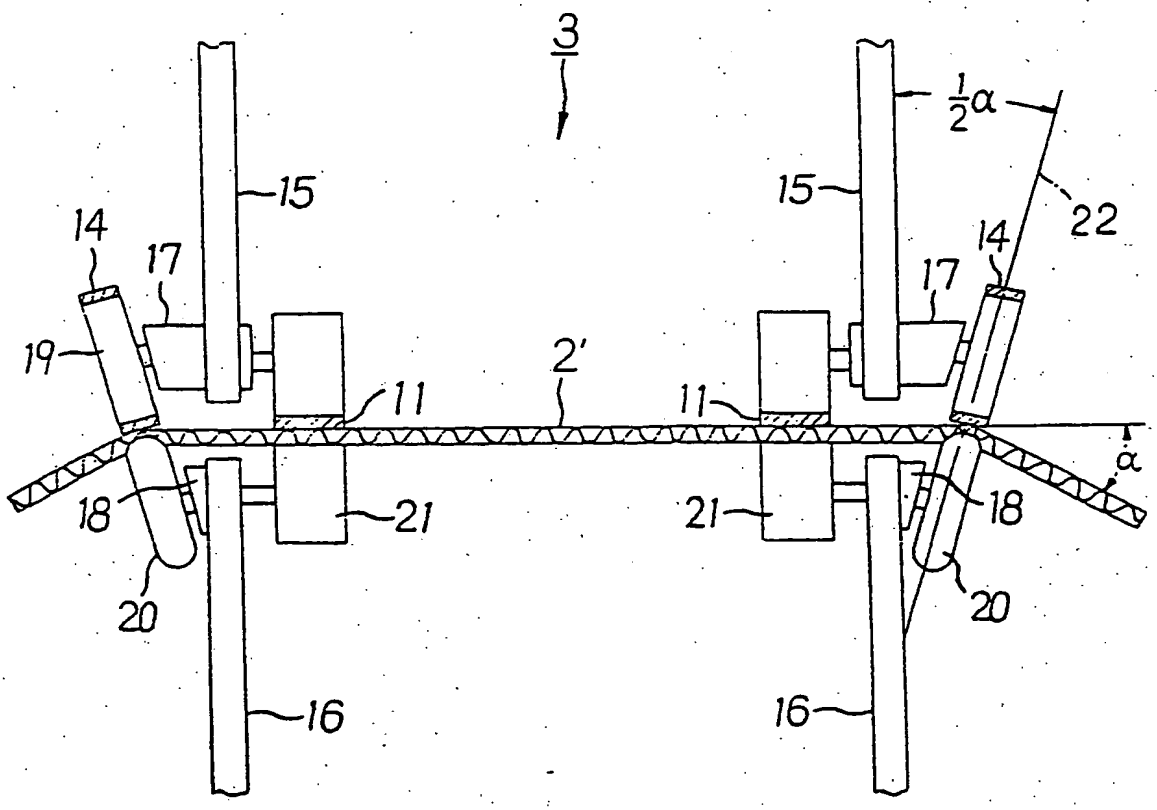


Fig. 10



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Fig.11



European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 82 10 7488

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	US-A-2 185 675 (H.L. MITCHELL et al.) * Page 1, lines 9-28; page 2, lines 44-47; claim 4; figure 5 *	1	B 31 B 5/58 B 31 B 1/26
Y	US-A-2 379 127 (A.W. WERNER) * Page 1, lines 8-16; page 3, lines 4-9; claim 11; figures 4,5,7 *	1	
A	FR-A-1 407 298 (UNIVERSAL CORRUGATED BOX MACH. CO.) * Page 1, lines 19-38; page 3, lines 6-29; figures 10,12-15 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

B 31 B
B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	01-12-1983	ESCHBACH D.P.M.

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